

THE SPIDERS OF THE HIGH-ALTITUDE MEADOWS OF MONT NIMBA (WEST AFRICA): A PRELIMINARY REPORT

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Spiders are abundant in the high-altitude meadows of the Nimba mountains, in Guinea. Collections have been carried out in this ecosystem where grass ground cover is dominant: this preliminary study at the family level concerns specimens collected in March 1991. It already gives some data on the localisation of the spiders. More than 20 families are represented along the mountain tops. A provisional list of these spiders has been drawn up. Most specimens were Araneidae, Gnaphosidae, Hersiliidae, or Salticidae. Their distribution in the herbaceous stratum as well as along an altitude gradient between 800-1700m is being analysed.

Les araignées sont abondantes dans les prairies de haute altitude des Monts Nimba, en Guinée. Des récoltes ont été effectuées dans cet écosystème où la couverture herbacée est dominante. Cette étude préliminaire au niveau des familles concerne les spécimens collectés en mars 1991. Elle apporte déjà quelques éléments sur la localisation des araignées. Plus de 20 familles sont représentées sur ces sommets et une liste provisoire en a été établie. La plupart de ces araignées sont des Araneidae, des Gnaphosidae, des Hersiliidae ou des Salticidae. Leur distribution est analysée dans la strate herbacée ainsi que selon un gradient altitudinal entre 800 et 1700m. □ *Spiders, biogeography, Africa, montane.*

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The Mont Nimba biosphere reserve, located in West Africa, is the subject of a multidisciplinary study as part of a UNESCO pilot project. These mountains have been classified as an Integral Natural Reserve since 1944. Over the past 50 years, many more animals have been collected during several scientific expeditions directed by Professor Maxime Lamotte (Lamotte, 1943). Many papers have been published on the Nimba mountain range. However works on the spider fauna are non-existent. Hence the organization of the spider populations are still little known. Especially in this tropical region, no work deals with the ecology of spiders except for the research initiatives in the Ivory Coast, in the savanna of Lamto (Lamotte, 1943, 1967; Blandin, 1974; Blandin and Célérier, 1981).

With this subject of research in mind, another field trip was made to Guinea in March 1991. The new collection of spiders made there complements those of Mr Lamotte and his associates. This abundant material is in the process of being classified. An attempt is being made to describe the structure and function of the spider community in this tropical ecosystem.

The programme focuses on the spiders of the high-altitude meadow, relatively less-frequently collected than those of the savanna or the head of

ravines (Lamotte, 1958). This environment is characterized by the strong contrast between the dry and rainy seasons. It presents a characteristic fauna with several endemic species.

In this paper, preliminary data dealing with the localisation of the different families of spiders collected in March 1991 are presented. The overall study will lead to a more detailed inventory of the spiders along the mountain ridges, as well as a better knowledge of their distribution with altitude and the relative abundance of the different species.

ENVIRONMENT AND CLIMATE

Mont Nimba is situated in High Guinea, near the borders of Liberia and the Ivory Coast (Fig. 1). It extends from SW to NE for about 30 km into guinean territory. All the crests stand over 1000m. The mountainside is steep and notched by valleys with sheer slopes. No trees or shrubs are present on the crests. Only some small trees of the inferior savanna grow at lower altitude on the slopes (Schnell, 1966). Above 900-1000m, the forest is confined particularly to the ravines. The mountain range is covered by herbaceous plants with a grassland structure. The term of montane or sub-montane has been given to this

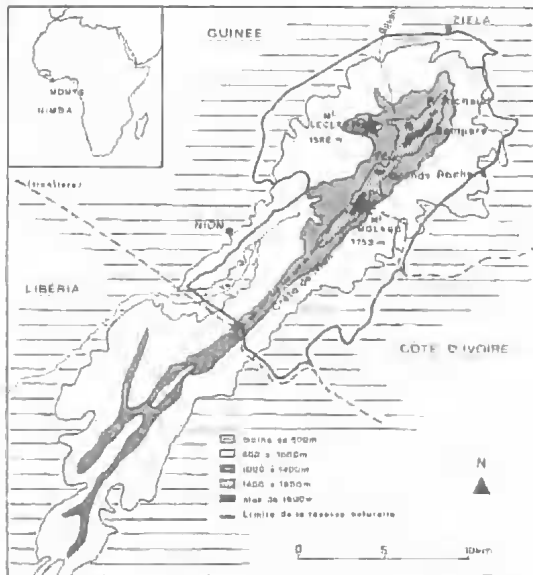


FIG. 1. Map of Mont Nimba, West Africa. Situation of the various sample zones along the Mont Nimba crest.

crest vegetation (Schnell, 1987). In this type of meadow, located in the guinean part of Nimba, the low (about 20-30cm or less) graminaceous species *Loudetia kagerensis* is abundant and constant. This grass forms a predominant group associated with other tall or short species, varying from site to site.

Mont Nimba receives abundant rainfall and a dry season not exceeding three and a half months. Generally, high-altitude meadows are often covered in fog during the rainy season, from May to November. Precipitation is fine and stable. During the other periods of the year, clouds seal the slopes and progressively cover the crest. Thus the humidity, which is closely bound to the degree of precipitation and nebulosity, varies with altitude and also along the crest. For example, the crest of Nion, spreading upwards to Mont R. Molard in the NE, is wetter than either Mont P. Richaud or the region of Sempéré (Leclerc *et al.*, 1955). Nevertheless, seasonal variations do exist. In the meadow, this factor does not seem to be very important to the ecological cycle of the fauna.

The spiders listed here were collected in March 1991, during the transition period just before the rainy season. Sudden storms or regular strong precipitations occur in the late afternoon from April onwards.

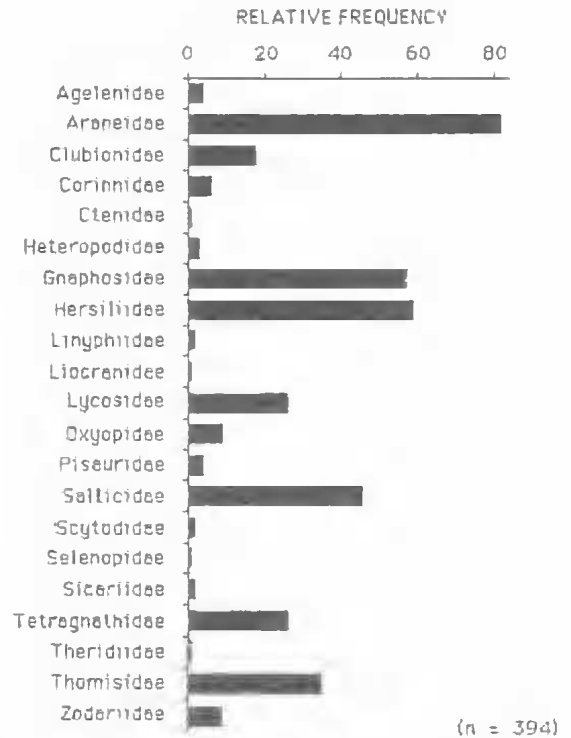


FIG. 2. Total no. spiders taken during March 1991.

METHODS

Up until now, the high-altitude meadows of Mont Nimba have rarely been sampled. The present study lasted 20 days (8-27 March) with only 14 days of sampling. The first phase consisted in obtaining an overall idea of the spider communities over the whole crest. The collecting program was prepared as follows: 4 days in Sempéré, Grands Rochers; 4 days on the Nion crest, 2 days in Grands Rochers. R. Mollard; 3 days on Mont Leclerc and 1 day in Ziéla, P. Richaud.

No strictly quantitative sampling methods were used. Several gathering squares (1m x 1m) were made but the results are insufficient. In addition, these quadrats have not been well materialized because the transport of materials was not easy. Only the sizes were marked by various elements found on the ground. Furthermore, this type of analysis is rare in these environments. Some information on the vertical distribution of the spiders was obtained by the use of beating and ground sweeping methods. A few specimens found on the high sections of the grass were captured, but this is certainly not a representative

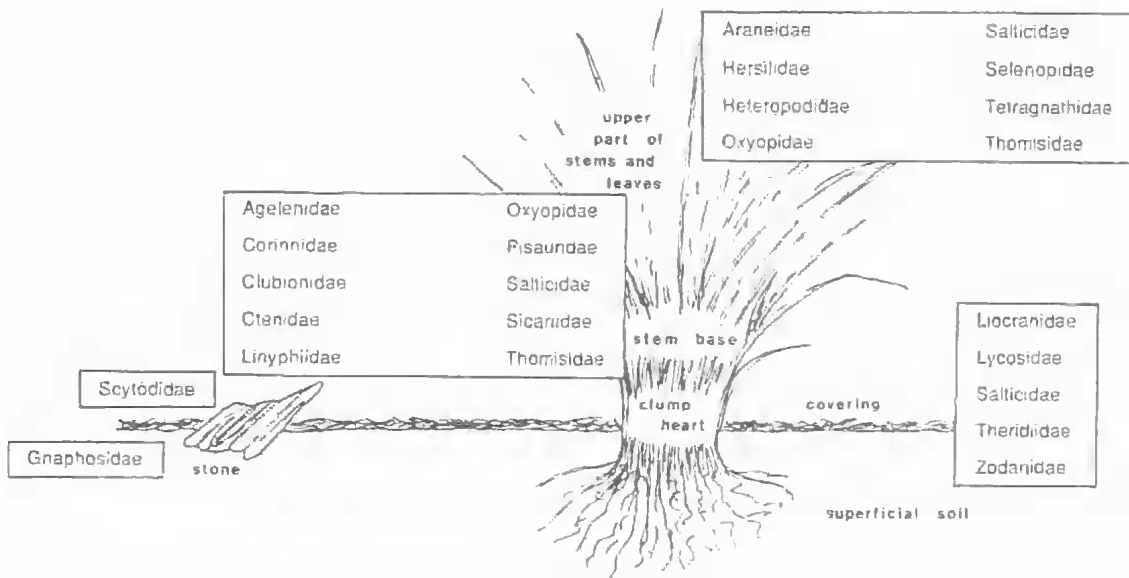


FIG. 3. Distribution of families in epigeal environment.

sample of the spider fauna of the herbaceous stratum.

So, in the low herbaceous stratum, samples were made by visual searching in vegetation and under stones, using forceps and pooters. Collecting was only carried out during the daytime and was therefore not exhaustive. The time spent on Mont Nimba was rather short: the researchers stopped collecting at the end of an hour at each site.

A mean of 40 individuals was collected per day, by one to three collectors depending on the days and the availability of the expedition members.

RESULTS

FAMILIES IDENTIFIED

For each sample, the spiders were sorted and enumerated by family. Young and adult spiders were counted together. Immature spiders represent about 54% of all specimens found.

Mygalomorphs were collected, but not in great numbers: 0.5% (2/435). For the moment, the inventory of this suborder has not been established at the family level. Similarly, about 9% (39/435) of the collection is still at the level of indeterminate araneomorph. Therefore, we are only able to present results of the determinate araneomorph families, which correspond to 394 specimens. The names used follow Brignoli (1983) and Platnick (1989).

At least 21 families have been recorded along

this crest, of the roughly 100 families known worldwide (Table 1). This relatively high number provides a good idea of the diversity of this environment. The high-altitude meadow-like plateau savanna characterized by the grass species *Loudetia*, is usually considered to be one of the poorest habitats. However, this type of environment clearly possesses an important variety of spiders.

Furthermore, the relative frequencies of these spiders gives another indication of their diversity (Fig. 2). The physiomy of the araneological community is characterized by the predominance of Araneidae which represent around 21% of determined spider families. Four other families were common: Gnaphosidae (57/394), Hersiliidae (59/394), Salticidae (46/394) and Thomisidae (35/394). We note that these spiders are generally large and therefore easier to find. The same observation can be applied to other families which are more easily collected, especially for a certain size. However, the fewer Clubionidae, Lycosidae, Oxyopidae, Pisauridae, Selenopidae and Tetragnathidae in the collections could indicate that they are less abundant in the meadow during this period of the year. The specimens belonging to most other families are generally small and consequently poorly collected. In addition, Liocranidae and Zodariidae are active and move quickly on the soil, so they frequently evaded capture.

VERTICAL STRUCTURE OF THE SPIDER COMMUNITY

The quality of a sampling must take into con-

Agelenidae	Hersiliidae	Scytodidae
Araneidae	Linyphiidae	Selenopidae
Clubionidae	Liocranidae	Sicariidae
Corinnidae	Lycosidae	Tetragnathidae
Ctenidae	Oxyopidae	Theridiidae
Heteropodidae	Pisauridae	Thomisidae
Gnaphosidae	Salticidae	Zodariidae

TABLE 1. List of spider families on Mont Nimba

sideration the biology and the size of the spiders. All families are represented, in spite of the small number of specimens. Around two-thirds of these families frequent the herbaceous stratum and most are diurnal (Fig. 3).

On the upper part of the stems and leaves of plants, the spider community is composed of eight families of which the Araneidae, Tetragnathidae, Hersiliidae and Thomisidae are the most common. The former two build their webs about 20 cm above the soil. Of all Araneidae, Oxyopidae and Salticidae, 25, 2 and 1 specimens respectively were collected by beating and sweeping of the ground. Ten families are present at the base of the stems or in the center of the clumps, Clubionidae being the most abundant. The clubionids are nocturnal hunters and easily found in nests among the vegetation. Five families occur in the superficial soil layer. The Lycosidae constitute most of the collections. Gnaphosidae are mostly nocturnal hunters found in nests among stones. Scytodidae are also found nocturnally active around stones.

Thus, each level of this epigeal environment seems to possess its own spider community, characterized by its family composition. Nevertheless, some of them such as the Salticidae, Thomisidae and Oxyopidae are present at all levels of the vegetation and the soil surface. Only analysis at the species level will permit the clarification of the distribution of the spiders in each stratum.

ALTITUDINAL DISTRIBUTION

The spiders were collected along the crest, mainly situated above an altitude of 1200m. The results are presented by altitudinal classes of 200m, principally because of the small numbers of spiders, and the various sampling zones are indicated in Fig. 1.

An overall view indicates that some families appear to be better represented at the highest altitudes, from 1200m to around 1700m (Table 2). The numbers of Gnaphosidae and Clubionidae regularly increase. Most other families did not

	Altitude (m)				
	800	1000	1200	1400	1600
Oxyopidae					9
Theridiidae					1
Linyphiidae				2	
Sicariidae				2	
Selenopidae				1	
Ctenidae				1	
Liocranidae				1	
Agelenidae			4		
Corinnidae			5		
Tetragnathidae			26		
Gnaphosidae			5	17	35
Clubionidae			3	5	10
Zodariidae		2		7	
Araneidae	4		11	11	56
Salticidae	4	1	8	9	24
Hersiliidae	8		22	21	10
Thomisidae	3	2	9	15	6
Lycosidae	2	8	11	5	3
Scytodidae	1				1
Heteropodidae	2	1			
Pisauridae	3	1			
TOTAL NUMBER OF SPECIMENS	25	15	102	97	155
NUMBER OF FAMILIES	8	6	10	13	10

TABLE 2. Altitudinal distribution of spider families in meadow of Mont Nimba.

provide many specimens, with the exception of Tetragnathidae. These spiders are perhaps rare or difficult to observe, but it is all the more interesting to note that their distribution is limited to a certain altitude. In the same way, Eusparassidae and Pisauridae are found only up to 1200m, in low vegetation. The lack of data, between 1000 and 1200m altitude, for the Araneidae and Hersiliidae is probably due to sampling problems. Spiders of these families as well as the Salticidae, Thomisidae and Lycosidae, are certainly present at the different altitudes, and it is likely that the same is the case for the Zodariidae. The family diversity seems to increase slightly with altitude.

The collections made on slopes from 800m upwards concentrated particularly on Mont Leclerc (Table 3). Here too, we note the diversity of the spider fauna, with 14 families present of the 21 listed for Mont Nimba. The same families are found at the highest altitudes. Only Zodariidae and Clubionidae are not encountered below 1400m. Salticidae, Hersiliidae, Thomisidae and Lycosidae can be found from 800 to 1600m.

We also compared the spider families found at three points along the crest: P. Richaud, Grands Rochers and Nion crest, between 1200 to 1600-

	ALTITUDE (m)			
	800	1000	1200	1400
Sicariidae				1
Ctenidae				1
Liocranidae				1
Clubionidae				4
Zodariidae				7
Gnaphosidae			2	14
Araneidae	4		3	3
Salticidae	4	1	2	3
Hersiliidae	6			12
Thomisidae	3		3	11
Lycosidae	2	4	1	3
Heteropodidae	2	1		
Pisauridae	3	1		
Scytodidae	1			
TOTAL NUMBER OF SPECIMENS	25	7	11	60
NUMBER OF FAMILIES	8	4	5	11

TABLE 3. Altitudinal distribution of spider families on Mont Leclerc.

1700m altitude (Table 4). Seven families are present on the Nion crest, clearly a lower diversity than on P. Richaud with eleven families. Six families were observed at all three places. Only Tetragnathidae were found south of the crest. This place seems to be more humid than the others at different periods of the year. The spiders found there are generally hygrophilous species.

For the moment, we cannot provide definitive results on the ecological requirements of the

families present only on P. Richaud and Grands Rochers. However, more precise information, at the species level will, hopefully, be available in the future.

COMMENTS

Spiders occupy an important place among the invertebrate fauna of Mont Nimba. They are represented by about twenty families which is a relatively large number for this type of highland meadow. This study is only a first approach; the diversity of the spider community according to stratum and altitudinal level will certainly prove to be rewarding, both quantitatively and qualitatively, with the determination of species. Publication of the final results will probably be delayed because of taxonomic difficulties.

Nevertheless, this study already gives some results at the family level. Prudence in the interpretation of these results is necessary, because the families do not always form homogenous ecological units. The sampling methods used must also be taken into consideration. In the tables and figures, we see that the distributions found are dependent on the collecting effort. In this study we used mostly visual-hunting, with no collecting at night. So we only have a partial sample of the spider families, mainly representing those with diurnal activities. As yet, pit-fall traps have not been used to intercept nocturnal spiders. Nevertheless, an estimation of the spiders present along the Mont Nimba crest and their spatial distribution has been made.

We observe several components of this spider

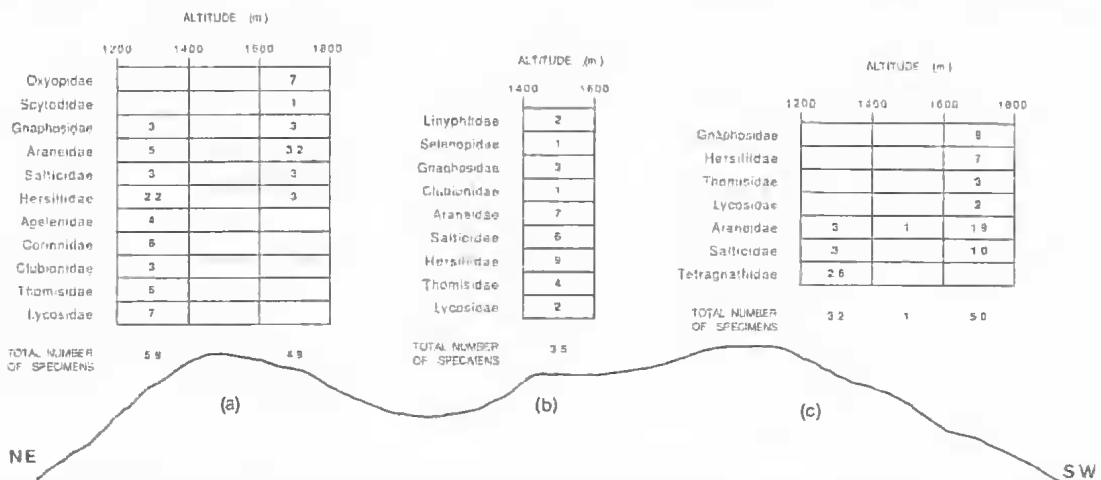


TABLE 4. Altitudinal distribution of spider families along Nimba crest, from SW to NE: (a) Pierré Richaud; (b) Grands Rochers; (c) Nion crest before Richard-Molard.

community, not forgetting the movements of wandering spiders. There are groups on the soil surface principally characterized by Lycosidae and Salticidae; three other families, Liocranidae, Zodariidae and Theridiidae exist in smaller numbers. Groups in the lower part of the vegetation includes ten families, the most with few representatives; Clubionidae, Thomisidae and Salticidae exist in great numbers. A last group exist of the upper part of the herbaceous stratum where Araneidae, Hersiliidae and Tetragnathidae are found in a great numbers; the five other families are less well represented.

The comparison between the northern and southern parts of the crest indicates a possible tendency of one family (Tetragnathidae) to prefer greater humidity. The altitudinal distribution shows that some families, such as Araneidae, Salticidae, Hersiliidae, Thomisidae and Lycosidae, are present from 800 to 1752m. On the contrary, other families are preferentially localised at the highest or lowest altitudes. The spider families found between the altitudes 800 and 1000m, can be considered as being roughly comparable with those present in typical savanna with *Loudetia*. In this environment, there are a great number of spider families (Gillon and Gillon, 1974). More data will be required to confirm these tendencies, as well as their presence on the slopes according to a greater altitudinal gradient and along the whole of the Mont Nimba crest. In addition, some comparisons among sites, including absence of families, might be artefacts, due to relative rareness of representatives.

The study of all spiders collected during the previous expeditions directed by Prof. Lamotte will certainly provide supplementary elements to the various points mentioned in this paper. It will be necessary to characterize, with more precision, the araneological fauna of Mont Nimba. Blandin and Célérier (1981) already noted the misreading of this fauna in West Africa. In addition the well-collected environments are essentially savanna rather than high-altitude meadow.

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